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Gasoline: The Achilles' Heel of U. S. Energy Security

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Strategy Research Project

GASOLINE: THE ACHILLES HEEL OF U.S. ENERGY SECURITY

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GASOLINE: THE ACHILLES HEEL OF U.S. ENERGY SECURITY

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The United States remains the largest consumer of energy products in the world and is the second leading producer of green house gas (GHG) emissions. Our dependence on imported petroleum is undermining our control of our national security interests. Petroleum comprises 63% of the United States' energy consumption, with the transportation sector accounting for 68% of the oil consumed. Energy flexibility or diversity, rather than energy independence, is the key to improving our national energy security.

GASOLINE: THE ACHILLES HEEL OF U.S. ENERGY SECURITY

Safety and certainty in oil lie in variety and variety alone.

—Winston Churchill, 1913

The United States remains the largest consumer of energy products in the world and is the second leading producer of green house gas (GHG) emissions. As our country's trade deficit increases each year, the major contributor is petroleum imports, accounting for 80% of the increase.[1] The United States' dependence on imported petroleum is undermining our control of our national security interests. At the same time, our nation is doing long-term damage to the environment with our GHG emissions.

Core Problem

The United States must balance securing our energy future with protecting our environment from climate change. A holistic approach is required to solve this complex problem. We must reduce demand for petroleum, improve energy efficiency, and develop feasible alternative energy solutions to include emission capture technologies.

The demand for fossil fuels is increasing while many studies indicate that fossil fuel reserves may be decreasing, based on actual consumption data and growth forecast models. These conditions create competition for the available resources to maintain the economic engines of the nations in the interlocking global economy. Several prominent sources indicate that the use of fossil fuels is contributing to climate change, which will be addressed in a later section. However, no optimal solution presents itself for the dilemma of reducing GHG emissions without harming the global petroleum-based economic structure. There is no driving force to make a country sacrifice their standard of living to benefit other countries by reducing emissions. To

generate sustained interest in revamping the world's dependence on fossil fuels, a compelling reason must force nations to do so in the face of certain knowledge that the change will most likely harm their economic well-being, at least in the short term. Alternative energy sources will only become mainstream once they move beyond the realm of government subsidies and into viability under a free market.

This paper analyzes the impact on national security of using alternative energy sources to reduce our dependence on imported petroleum. We will never be energy independent without weaning our current transportation system off its appetite for oil. Approximately 63% of the United States' energy consumption is oil and gas and over 60% of oil is imported.[2] The transportation sector accounts for 68% of the oil consumed and almost one third of the nation's carbon footprint.[3]

In 2007 alone, the oil and natural gas industry's total value-added contribution to the United States' economy was over $1 trillion, accounting for 7.5 percent of U.S. GDP.[4] Converting even a portion of the global transportation infrastructure from petroleum to alternative fuel sources will require time, huge amounts of capital, and determined, courageous, visionary leadership, both political and commercial. The International Energy Agency estimates that industry and governments will need to invest $22 trillion between now and 2030 to meet the forecasted energy demand, not including the investment necessary to shift the global energy system to a lower carbon alternative.[5]

Energy flexibility or diversity, rather than energy independence, is the key to improving our national energy security. The United States needs to develop multiple options to fuel our economy.

Every alternative technology has drawbacks that constrain its successful implementation. Critical elements as diverse as water, lithium, arable land and rare earth metals each present its own challenges of supply and employment, and the technology each enables generates second and third order effects in the economy and the environment.

Energy Security

Before addressing the core problem, one must understand the definition of energy security. Geography, geology, infrastructure, supply and demand define energy security for any given country: Americans think about energy security primarily in terms of petroleum and transportation. The Baby Boom Generation remembers the lines at gas stations during the 1973 oil embargo imposed by the Organization of Petroleum Exporting Countries (OPEC) to punish the United States and Western Europe for their support of Israel against the Arab forces during the Yom Kippur War.[6] President Obama's policy on energy security is:

> Our reliance on oil poses a threat to our economic security. Over the last few decades, we have watched our economy rise and fall along with the price of a barrel of oil. We must commit ourselves to an economic future in which the strength of our economy is not tied to the unpredictability of oil markets. We must make the investments in clean energy sources that will curb our dependence on fossil fuels and make America energy independent.
>
> • Breaking Dependence on Oil. Promote the next generation of cars and trucks and the fuels they run on.
>
> • Producing More Energy at Home. Enhance U.S. energy supplies through responsible development of domestic renewable energy, fossil fuels, advanced biofuels and nuclear energy.
>
> • Promoting Energy Efficiency. Promote investments in the transportation, electricity, industrial, building and agricultural sectors that reduce energy bills.[7]

The American public's level of interest in energy security appears to rise and fall with the price of oil. Alternative energy options become feasible only when their higher cost is exceeded by the price of a barrel of crude oil, not out of any altruistic sense of concern for the environment by the average citizen. These dynamics militate against a long-term strategic approach to alternative energy sources; it creates a tension between American public policy, industrial profitability and economic survival of the average citizen.

Climate Change Background

There are many differing views on the extent and actual threat of climate change. This paper assumes that climate change due to increasing global temperatures is caused by GHG emissions and is an overall threat to the planet, based on the findings of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report.[8]

The United States Global Change Research Program, composed of 13 Federal agencies, reported in 2009 that climate-related changes are already being observed in every region of the world, including the United States and its coastal waters.[9] While climate change alone does not cause conflict, it could have significant geopolitical impacts around the world, placing a burden to respond on civilian institutions and militaries.[10] Some of the issues attributed to climate change are food and water scarcity, increased spread of disease and the potential to worsen mass migration.[11]

The unique challenge of climate change requires all nations to cooperate to reduce the levels of greenhouse gas emissions, in hopes of preventing possibly irreversible damage to the environment.[12]

Fossil fuels are not the only cause of GHG emissions. Figure 1 illustrates the many sources of GHG emissions around the world.

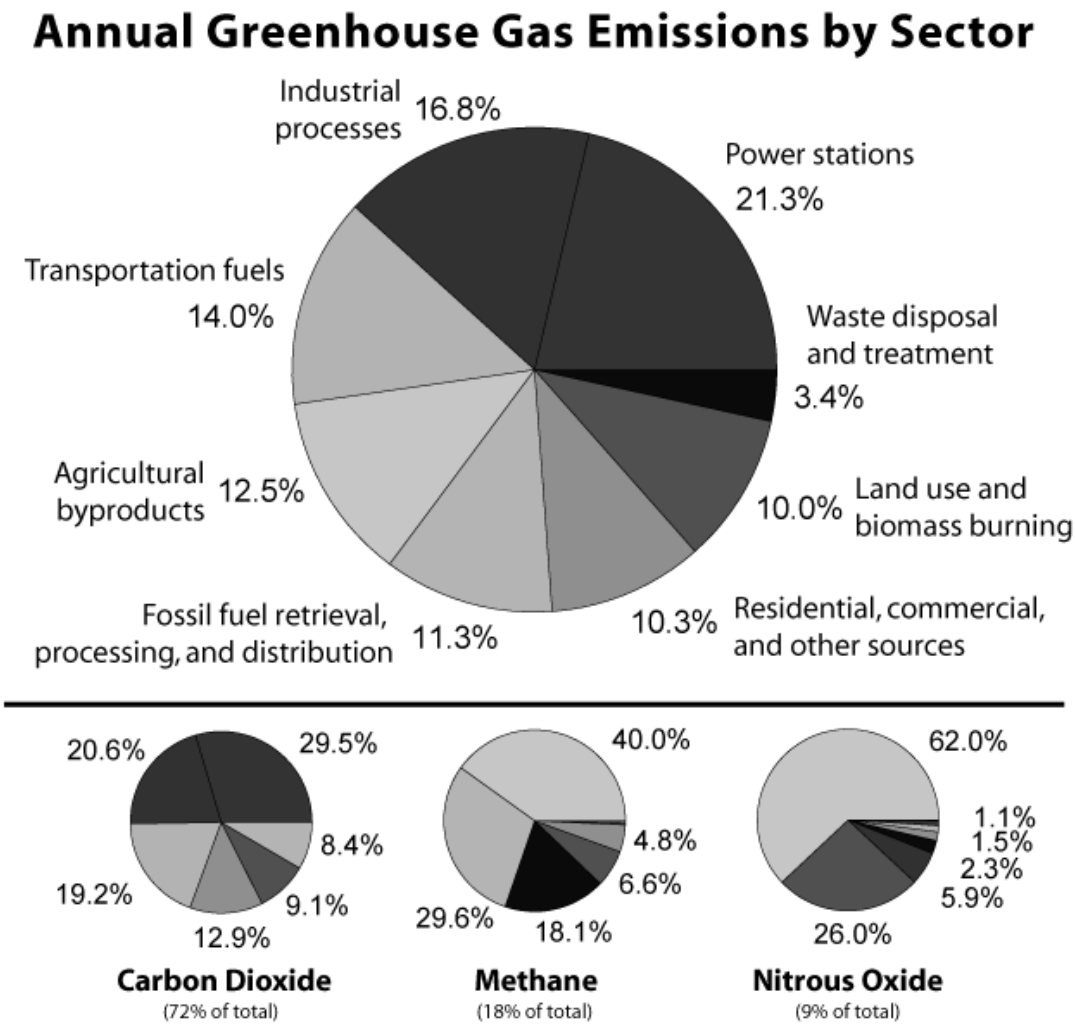

Figure 1 Annual Greenhouse Gas Emissions by Sector[13]

President Obama has steered United States policy toward a more engaged global role in the arena of reversing climate change. In March 2009, he spelled out his vision for this role.

> So we have a choice to make. We can remain one of the world's leading importers of foreign oil, or we can make the investments that would allow us to become the world's leading exporter of renewable energy. We can let climate change continue to go unchecked, or we can help stop it. We can let the jobs of tomorrow be created abroad, or we can create those jobs right here in America and lay the foundation for lasting prosperity.[14]

He demonstrated this new policy resolve by his high-profile role at the 2009 United Nations Climate Change Conference in Copenhagen. This stands in sharp contrast to the refusal by both President Clinton and Bush to submit for Senate ratification the Kyoto Protocol to the United Nations Framework Convention on Climate Change. Even with our increased leadership role, the Copenhagen Summit illustrated the difficulties of addressing global climate change. The conference produced no binding agreements or ways to enforce restrictions on the emissions of GHG. Individual countries balked at signing legal treaties that supported the effort. British Prime Minister Gordon Brown summarized the difficulties, "We must learn lessons from Copenhagen… Never again should we let a global deal to move towards a greener future be held to ransom by only a handful of countries."[15]

The Way Ahead to Meet the Vision

Our first step to meet the President's vision is to reduce our reliance on petroleum imports. This can be accomplished by reducing our petroleum consumption. The American people and industry have successfully done this before: fuel consumption declined by 15% between 1979 and 1985 through an increase in corporate average fuel economy (CAFE) standards for the nation's automobile fleet and by switching fuels for both transportation and power generation.[16]

85% of our petroleum consumption is for vehicle travel followed by air (9%) and rail and water (6% combined).[17] Our transportation system's reliance on imported petroleum causes the United States an economic dilemma. To maintain a vibrant economy, we must utilize our petroleum-dependent transportation system to ship goods and provide services. However, importing large quantities of crude oil to fuel our cars,

trucks, airplanes, trains and ships creates a trade imbalance which hinders economic growth.

An abundance of fossil fuels resources does not necessarily ensure a country's energy security. The United States was the third leading producer of oil in 2008 but at the same time, we were the world's leading consumer of petroleum.[18] Americans use 19.5 million barrels per day, more than three times our annual production.[19] The United States on average imported 8.296 million barrels of crude oil per day in February 2010, while our average daily domestic production was 5.445 million barrels for the same month.[20] And now our Achilles heel for energy security becomes apparent: U.S. gasoline production was 8.802 million barrels per day over the same time period, accounting for over 94% of imported crude oil.[21]

Eliminating gasoline consumption by automobiles and light trucks would virtually end U.S. dependence on imported crude oil. Our near-term projected domestic refinery capability could almost supply the remaining petroleum requirements of our industrial and transportation systems: diesel (both automotive and marine), jet kerosene, the petrochemical industry and heating oil. We could import our remaining crude oil requirement from friendly neighbors in the Western Hemisphere: Canada, Mexico and Trinidad and Tobago.

To guarantee our energy security through diversified sources, we are currently forced to undermine our foreign policy positions by dealing with nondemocratic countries.[22] Oil producing states can affect our economy by limiting the supply of oil; state-owned oil companies control about 80% of the world’s petroleum reserves.[23] We

would condemn many of these countries for their human rights violations but we must often turn a blind eye because of our energy needs.

Reducing our demand for gasoline would yield foreign policy benefits. Our major economic competitor, China, does not face our same ethical conundrum about dealing with authoritarian, repressive regimes. The Chinese national oil company (SINOPEC) has state support to guarantee access to strategic reserves in developing countries such as Sudan, an aggressive strategy far beyond that encouraged by the U.S. government. Reducing our demand for gasoline would lessen our direct competition with China for oil from source nations in the Middle East and Africa. Our energy security would not be hostage to oil tankers transiting the Strait of Hormuz or the Strait of Malacca, chokepoints vulnerable to interdiction by hostile nations or terrorist organizations. Our diplomacy in the area of human rights would be less constrained in nations such as Saudi Arabia, Kuwait and Nigeria if we did not buy large quantities of petroleum from them. We could focus more of our efforts on maintaining closer ties with the countries in North and South America.

If Not Gasoline, What?

No feasible game-changing, disruptive technology exists in the foreseeable future to drive an electric car with a clean, on-board power source (such as a portable nuclear fusion plant). This report will consider two options to displace gasoline consumption: biomass fuel/natural gas and electricity from the grid. The use of alternative fuels must produce less greenhouse gases (GHG) than the use of gasoline to be considered acceptable. The discussion will examine the disadvantages of the sub-categories within these two broad areas to determine their feasibility and acceptability as a solution.

Biomass Fuels

Biomass accounts for 53% of the renewable energy consumed in the United States.[24] Henry Ford designed his Model-T car to run on alcohol and predicted alternative biofuels would replace gasoline as early as 1925.[25] Production of fuel from certain biological sources involves little or no carbon generation: algae, seaweed, cellulosic fiber plants and reclamation of restaurant cooking oil.

Mass production of biofuels is not the universal remedy for our petroleum dependency and GHG emissions. If the correct strategy is not employed, biofuels could actually increase climate change through deforestation to make room for biofuel crops. Indonesia temporarily rose to the position of number three GHG emitter in the world after an attempt to replace lush forest and peat lands with palm oil plantations for the European biodiesel market.[26]

The most pervasive alternative vehicle fuel in current use is ethyl alcohol, or ethanol; many states and cities mandate a gasoline blend containing up to 10% ethanol. Excessive use of corn to produce ethanol can increase hunger throughout the world. This increased demand for ethanol boosts the price of corn, providing farmers an incentive to shift production from other more locally suitable food crops to corn. This shift in turn inflates global food prices, increasing the burden on poor nations.[27]

The U.S. government protects our domestic ethanol industry with a protectionist tariff of 54 cents per gallon on imported ethanol, a practice that draws protests from our ethanol-producing neighbors such as Brazil.[28] Additional government intervention in the form of subsidies and tax breaks are required to keep our domestic ethanol industry viable.

Potable water is already in short supply in many parts of the world with over 1.1 billion people without access.[29] Growing corn and other crops for biofuels increases demand for water and could exacerbate existing shortages. Developing countries could be forced to choose between domestic sources of alternative fuels and energy self-sufficiency, or providing water for human consumption; this could inflame tensions in areas where water shortage is already severe.

Natural Gas

Etienne Lenoir in 1860 made natural gas a viable transportation fuel with his creation of a natural gas internal combustion engine vehicle.[30] Natural gas is the cleanest of all the fossil fuels[31] and the U.S. has a plentiful supply, both as unassociated deposits and in coal seams, and as a byproduct of crude oil production. One of the biggest challenges is determining the amount of available reserves. As technology and exploration expands, more usable reserves are discovered but, like crude oil, there is a finite amount of natural gas available. The United States' current proven natural gas reserves equal almost 11 years of supply at the present consumption rate of 23 trillion cubic feet (tcf) per year.[32] The United States has an estimated 1536 tcf of undiscovered technically recoverable reserves of natural gas.[33]

Presently less than one percent of the United States' demand for natural gas is in the transportation sector[34] but many vehicles in Asia and buses in some major American cities have successfully implemented this fuel. The factors inhibiting a wholesale switch to natural gas-powered vehicles include the high initial cost of construction of a retail distribution infrastructure on a national scale, lower power output than gasoline engines and the need for improved onboard gas storage technology.[35]

Electricity

Three sources of electricity to support conversion to electric vehicles powered from the grid are renewable sources, nuclear power, and fossil fuel plants. The United States does not require a complete overhaul of its electric grid infrastructure to support the expanded use of electric hybrid vehicles.

Renewable sources produced 3.3% of the energy consumed in the United States.[36] Hydroelectric, winds, geothermal and solar are the primary renewable sources for electricity and they produce little or no GHG emissions. But they all cannot compete efficiently with other power generation sources yet. With current technology, 5000 wind-turbines or 625,000 solar panels are required to produce the same amount of energy as one coal-fired plant.[37] The trade-off would be the large amount of land required for wind and solar farms, plus additional right-of-way needed for the new electric transmission lines.

Hydropower is the leading renewable energy source for electricity. Most of the areas suitable for hydropower have already been developed; there is limited room for expansion without creating serious second- and third-order effects. The construction of new dams could impact river flow and fish migration, in some cases. Our relations with Mexico could be strained by further diversion of water from rivers such as the Colorado. A final cautionary note is hydropower's dependency on sufficient water levels. Venezuela is a leading petroleum exporter who is in the midst of its own energy crisis because of its reliance on its Guri Dam for 73% of national electricity needs.[38] Reduced water levels stemming from an ongoing drought are requiring Venezuela to import electricity from neighboring countries.[39] Venezuela is a vivid example of why being oil-independent is does not necessarily translate into energy security.

Wind is the third choice for renewable energy behind biomass and hydropower, producing 7% of renewable energy in the United States.[40] Wind turbines are limited to certain areas with the right weather conditions to be productive and further pose a threat to birds. They often impinge on scenic views, making them less appealing to the American public. Wind turbines are at the mercy of the weather, so backup generation must be planned to avoid service interruptions. Finally, on average, the production of each wind turbine requires 500 pounds of rare earth metals (to be addressed in a later section) and large amounts of energy.[41]

Geothermal sources currently produce 5% of the renewable energy consumed in the United States.[42] There are several drawbacks that limit the rapid expansion of geothermal to include: sites frequently located in remote areas, long lead time for new projects, and large entry barriers in regards to high initial investment and risk.[43]

Solar power is the least used of the renewable sources, providing about one percent of America's renewable energy.[44] As previously noted, solar power generation requires a large surface area to overcome its low efficiency. Production of photovoltaic cells and storage batteries involves several toxic byproducts.[45]

Nuclear energy produces almost zero carbon compared with fossil fuels power generation. The United States is one of the top producers of nuclear power in the world although it accounts for only nine percent of our energy.[46] The drawbacks to nuclear power include high plant construction costs and long lead times, disposal of spent fuel rods and the risk of nuclear proliferation.

Natural gas as mentioned before is the cleanest burning of the fossil fuels, making it a favorite choice for the electric power industry for supplying peak demand

periods. Natural gas provides significant economic benefits and technological advantages over other alternatives.[47] Over 50% of the power stations being built in 2009 were natural gas fueled.[48]

Coal is the most abundant power generation resource available to the United States with reserves ranging from 146 years to 234 years of current consumption.[49] Unfortunately, coal is one of the dirtiest fuel sources, creating carbon emissions throughout its lifecycle, from production through railroad transportation to burning. Based on projections, the use of coal will not decline in the near future so we must emplace technology to make it a cleaner process. Researchers are doing a tremendous amount of work on carbon capture and sequestration (CCS) technology to accomplish this task.

Rare Earth Metals: the Downside to Alternative Energy

Unfortunately, reducing our demand for imported petroleum will not diminish the chance of conflict with other nations battling for limited natural resources and fighting to keep their economic engines running. Several prominent alternative energy technologies utilize a very scarce natural resource: rare earth metals (REM). These consist of chemical elements with atomic numbers between 57 and 71 on the periodic table, such as lanthanum, cerium, erbium and neodymium.[50] These elements are critical to the manufacture of magnets used in generators, rechargeable batteries for electric cars, and lasers, and in the steel and glass industries.[51] China produces 95% of the rare earth metals and has reduced the amount available for export by 40% over the last seven years.[52]

The only commercial rare earth metals mine in the United States, at Mountain Pass, California, was closed by its owners, Molycorp Minerals, in 2002 because

Chinese producers undercut the global prices with their REM exports.[53] China currently has a monopoly on the refinement of rare earth metals. If the United States restarts the mining of rare earth metals, it lacks the refining capacity to use them without extensive modernization.[54]

Congress demonstrated its concern over U.S. production of rare earth metals when it ordered the U.S. Government Accountability Office in 2009 to undertake a comprehensive review of American dependence on rare earths for military applications, generating the Rare Earths Supply-Chain Technology and Resources Transformation Act of 2009 (RESTART Act).[55] As the demand for green technologies grows, the increased demand for rare earth metals could create a global strategic commodity on the magnitude of crude oil.

Hybrid vehicles also use lithium batteries for their power source. 75% of the world's lithium is found in the Atacama Desert shared by Chile and Bolivia. These countries have a history of conflict that still simmers today. The United States imports 61% of its lithium from Chile.[56] Bolivia's lithium is exported through Chile because they do not have their own port access.[57] As the demand for lithium increases, the chance of conflict will rise as both countries will see their economic interests challenged. Additionally, the current leftist Bolivian government does not have a cordial relationship with the United States which could potentially undermine our energy security objectives.

Recommendations

We must implement a comprehensive plan to maintain our energy security while reducing GHG emissions. Our current alternative energy solutions do not produce the benefits required to change from our fossil fuel economy in the next 20-30 years. Until a

disruptive energy technology solution is discovered, our plan should incorporate the four major areas listed below.

- Secure our critical natural resources: fossil fuels and rare earth metals.
- Change American behavior to reduce demand and increase efficiency.
- Revitalize our current energy infrastructure by improving emissions capture technology and smart grid implementation.
- Maintain the United States as a global leader on climate change through participation in the Major Economies Forum on Energy and Climate Change (MEF).

Secure Our Critical Natural Resources: Fossil Fuels and Rare Earth Metals

Much of today's rhetoric addresses independence from imported Middle Eastern oil to improve our energy security. The key to maintaining our energy security is not neglecting our key suppliers in neighboring countries. Fortunately, 39% of our imported oil is from neighbors in the Western Hemisphere: Canada provides 18% while Venezuela contributes11% and Mexico accounts for a further 10%.[58] Only 18% of our oil was imported from countries in the Persian Gulf, predominantly Saudi Arabia, in 2008.[59] Venezuela presents some challenges with its relationship with China and President Hugo Chavez's anti- American positions.[60] Venezuela is more dependent on the United States than it is willing to admit. In this symbiotic relationship, 60% of Venezuelan petroleum exports go to the United States, who is the only country with significant infrastructure to refine Venezuela's specific type of crude oil.[61] China is trying to capitalize on this with significant investments in Venezuela's petroleum infrastructure.

China is also aggressively pursuing contracts and long term deals with Canada for petroleum from its tar sands. We need to ensure Mexico is not destabilized by its continued drug wars and economic woes. Our energy security could be jeopardized before climate change can impact our security if we do not pay attention to our own backyard.

The Strategic and Critical Materials Stock Piling Act provides the president the flexibility to add materials in the interest of the National Defense after notification and justification to Congress.[62] Title III of The Defense Production Act of 1950 authorizes the president to expand and protect the industrial base to meet government security requirements.[63] An adequate amount of rare earth metals should be purchased for the Defense National Stockpile Center (DNSC) under the Defense Logistics Agency to provide for the future development of alternative technologies and our national defense weapons systems until our domestic rare earth metals mining and refining capacity is rebuilt.

Change American Behavior to Reduce Demand and Increase Efficiency

The easiest way to reduce the demand for gasoline is to increase the price through taxes. The government could create a tax structure that forces consumers to bear the burden of the social harm caused by their gasoline use.[64] The United States has the lowest tax rate per gallon of gasoline compared to other economically developed countries by a factor of four or five.[65] The revenue from an increased consumer gas tax could be dedicated to the development of alternative energy solutions. Increasing the retail price of gasoline would cause Americans to analyze their choices for vehicle types, trip lengths and public versus private transportation, forcing efficiency via “the wallet.”

Raising the gasoline tax is another incentive for consumers to switch to bio-fuels. The American public would support the removal of protectionist tariffs on bio-fuels to allow cheaper imports while focusing American farmers on producing crops that can be exported to minimize hunger and suffering in developing nations.[66]

Flex fuel capability provides the capacity to operate on any combination of gasoline and alcohols such as ethanol and methanol, which made from feedstocks including agricultural byproducts, municipal waste, coal and natural gas[67]. Mandating all new cars to be flex fuel capable is a small investment for improved energy and climate security; the average added cost is $100-$300 per vehicle.[68] Since the average car is driven for 16 years, now is the time to act to break our reliance on one fuel.[69]

Furthermore, flex fuel capability provides the diversification required to maintain energy security. Exporting this technology to developing countries can help them curtail their economic appetite for petroleum while they are making decisions about infrastructure investments. Flex fuel vehicles would provide them with multiple options for fuel that could jump start their economies while tangibly lessening their impact on climate change.

Revitalize Our Current Energy Infrastructure by Improving Emissions Capture Technology and Smart Grid Implementation.

The United States must develop and implement “smart” electric grid technology that can be powered by multiple fuel sources. This technology can become the standard for implementation in the developing world where there is a very limited infrastructure and varying local resources. The increased demand caused by hybrid vehicles and more technology challenges the current American electrical transmission and distribution grid. Several local utilities are making incremental improvements but an

overall government effort would be beneficial. Energy Secretary Steven Chu took the initial steps in December 2009 with the first-ever effort to take a collaborative, comprehensive look across each of the three transmission interconnections in the United States.[70] He stated, “This will ensure that we are effectively planning, building and strengthening the transmission networks the U.S. needs to operate a reliable, efficient and secure electricity system.”[71]

An example of a successful government program was the creation of the Tennessee Valley Authority (TVA) by President Franklin D. Roosevelt as part of his New Deal initiative.[72] The TVA is over 70 years old and still providing electric service to customers. Congress originally appropriated funds to operate the TVA but today, the TVA is self-sufficient with annual revenues over $9 billion.[73] A modern-day TVA program to develop and implement smart grid technology would create jobs while improving our reliability and efficiency.

To guarantee our energy security, we must be willing to increase our use of fossil fuels in the short term with improved emission capture technology until alternative energy resources are readily available. The investments made in clean-burning coal technology and carbon capture and sequestration will lower global competition for scarce resources while reducing GHG emissions. This is not ideal but it is a feasible solution to increase energy security while reducing the environmental impact.

Clean-burning coal technology is available now for new plants. The first new nuclear reactor for the United States is not scheduled to be operational until 2017, so there will be no measurable reductions in emissions before 2020 by switching more generation to nuclear plants.[74] Coal will continue to be the largest source of U.S.

electrical power for the near future and the technology to lessen its carbon footprint exists now.

Maintain the United States as a Global Leader on climate change through participation in the Major Economies Forum on Energy and Climate Change (MEF).

President Obama announced the Major Economies Forum on Energy and Climate (MEF) on March 28, 2009 in concert with the leaders of the sixteen largest economic powers: Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, South Africa and the United Kingdom.[75] The MEF is intended to facilitate a candid dialogue among major developed and developing economies, help generate the political leadership necessary to advance the exploration of concrete initiatives and joint ventures that increase the supply of clean energy while cutting greenhouse gas emissions.[76]

This initiative shows a huge potential to improve our global situation with regard to energy and climate change. This organization represents the countries that have the actual capabilities to effect change rather than the diluted voice of the members of the United Nations Climate Change Summit, where all have equal votes regardless of energy and GHG impact. The MEF members possess the technical and economic prowess to implement the changes required to reduce energy demand and to minimize climate change. The MEF sponsored the study "Global Gaps in Clean Energy Research, Development, and Demonstration," prepared by the International Energy Agency.[77] The MEF promulgated a set of ten Technology Action Plans, focused on advanced vehicles; bioenergy; carbon capture, use, and storage; buildings sector energy efficiency; industrial sector energy efficiency; high-efficiency, low emissions coal; marine energy; smart grids; solar energy; and wind energy.[78]

The United States should continue its leadership role in the Major Economies Forum on Energy and Climate Change to enable a global solution to a global problem. There cannot be a distinction between developed and developing countries for GHG emission standards if reversal of climate change is to be successful. China and India, the first and third largest GHG producers according to the IPCC, are considered developing countries with consequent emission standards much less stringent than those applied to the United States or the European Union. We must leverage the synergy created in the MEF to develop a disruptive energy technology solution that will supplant our efforts to improve the current technologies.

Conclusion

There is no magic solution to solve our energy security and climate change dilemma. Alternative energy is not the only answer to providing energy independence for improved national security. A comprehensive strategy is required that provides the United States flexibility in meeting its energy needs and securing our future. The strategy must reduce our demand for gasoline, improve efficiency, be responsible in the use of limited resources for alternative energy and reduce emissions into the global commons. The United States must re-examine the current tariffs and incentives placed on fossil fuels and alternative energy methods to ensure we allow the free market and the global economy to influence viable options. Until we make some tough choices to reduce our demand for gasoline, it will remain our Achilles heel of energy security.

Endnotes

[1] Economic Letter of the Federal Reserve Bank of San Francisco, Number 2006-24, September 22, 2006 www.frbsf.org/publications/economics/letter/2006/el2006-24.html (accessed November 11, 2009), 1.

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